

# Suspension-Polymerised Latex as Surface Sizing Additive and Cobinder for Papermaking and Coating

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**1. Introduction** – Diverse types of surface sizing additives, including various types of polymers and latexes are widely applied to improve the mechanical and surface properties of paper. The physical and chemical properties of latexes, which significantly influence their use as surface sizing additives, are dependent upon various factors including monomer, stabiliser, particle size, etc. In this research, suspension-polymerised latexes with different compositions and particle sizes were prepared and their applicability as a surface sizing additive was examined and compared with conventional emulsion-polymerised latexes. The stability of the suspension-polymerised latexes was optimised using oxidised starch and polyvinyl alcohol as stabilising agents. The suspension-polymerised latexes were found to be more stable than the conventional latexes across a wide pH range, and highly compatible with the conventional surface sizing solution. The suspension-polymerised latexes were tested for use as an additive for surface sizing in combination with oxidised starch, and their effect on the mechanical properties of paper, such as tensile strength, extensional property and bending stiffness, were examined. The suspension-polymerised latexes gave greater improvements in tensile strength and extensional property than emulsion-polymerised latexes, suggesting their potential ability to reduce the fold cracking of coated paper.

**2. Experimental** - To optimise the polymerisation method to prepare the SP latex as an additive for surface sizing and coating cobinder, a number of trial experiments were conducted. Several key factors including monomer composition, stabilizer, particle size, etc. were optimized. The rheological properties and chemical stabilities of the latexes were investigated and compared with conventional emulsion polymers.

**3. Results and Discussion** - SP latexes were prepared and tested as surface sizing additives. Selection of the stabilising polymers and their proportions was critical in controlling the stability and particle size of the latex. Oxidised starch and PVA were chosen as protective polymers. The ratio of 70% core polymer to 30% stabilising (protective) layer was found to be the optimal composition to obtain a suspension latex with excellent stability against shearing and pH change. Trial results suggested that an improvement in tensile strength and extensional property could be achieved with the use of SP latex as a surface sizing additive. A mill trial was carried out to verify the effect of using SP latex as a surface sizing agent. The tensile strength and extensional property were improved while the stiffness was decreased after surface sizing with SP-M latex.

**4. Conclusions** - Results indicated that the use of suspension polymerized latexes would provide an opportunity to reduce the fold cracking after coating. The use of SP latex as coating cobinder also provided good extensional property for coating layer, which would improve fold cracking resistance of the coated products.